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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/781,898
Filing Date: February 20, 2004
Appellant(s): BOLLAPRAGADA ET AL.

Peter J. Rashid
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 7/7/2009 appealing from the Office action mailed 1/22/2009.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

Zitzler. E. et al., "Comparison of multiobjective evolutionary algorithms: Empirical results", Evol. Comput.; 2000 Vol. 8, pp. 173-195.

Hauskrecht, M., and Kveton, B., "Linear program approximations for factored continuous-state Markov decision processes." 2003. In the Proceedings of the 17th Annual Conference on Neural Information Processing Systems.

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-3, 5-8, 15, 17-19, and 22 rejected under 35 U.S.C. 103(a) as being unpatentable over Zitzler ("Comparison of Multiobjective Evolutionary Algorithms: Empirical Results").

Regarding claims 1, 17, and 22,

Zitzler teaches a method for multi-objective optimization based on competing objectives and a plurality of constraints, the method comprising: generating an initial population of solutions in a computing device to substantially cover a solution space having a plurality of dimensions defined by the competing objectives and the plurality of constraints; performing a first multi-objective process, based on the initial population and the competing objectives to generate a first interim efficient frontier in a solution space having at least two dimensions; performing a second multi-objective process, based on the initial population and the competing objectives to generate a second interim efficient frontier in a solution space having at least two dimensions; fusing the interim efficient frontier with the second interim frontier to create a fused efficient frontier (see pg. 182, section 6.2).

Zitzler teaches generating multiple Pareto sets for each algorithm being compared and fusing them into a single Pareto front by removing the dominated solutions from the joined set (see pg. 182, section 6.2). However, Zitzler teaches restricting to only two objectives in order to investigate the simplest case first. Therefore, Zitzler does not explicitly teach a solution space having at least three dimensions. However, it would have been obvious to one of ordinary skill in the art to extend the method of Zitzler to

include a solution space having at least three dimensions since multi-objective optimization involving at least three dimensions was known in the art at the time of invention and the only reason Zitzler restricted to two objectives was for simplicity.

Zitzler does not explicitly teach that the competing objectives and plurality of constraints constitute a portfolio problem. The types of competing objectives and plurality of constraints constitute nonfunctional descriptive material because the method of Zitzler would operate the same with any multi-objective optimization problem. Further, the recitation that the fused efficient frontier is for use in investment decisions is a statement of intended use. Therefore, the limitations directed to the competing objectives and plurality of constraints constituting a portfolio problem are not given any patentable weight.

Regarding claim 2,

Zitzler teaches wherein the generating the initial population of solutions uses a combination of linear programming and sequential linear programming algorithms (see pg. 182).

Regarding claims 3 and 18,

As discussed above in regards to claim 1, the types of competing objectives constitute nonfunctional descriptive material and are not given any patentable weight.

Regarding claims 5 and 19,

Zitzler teaches wherein the initial population of solutions includes multiple feasible points (see pg. 182).

Regarding claim 6,

Zitzler teaches wherein the multiple initial feasible points are generated by solving linear programs (see pg. 182).

Regarding claim 7,

Zitzler teaches wherein the linear programs utilize randomized parameters (see pg. 182).

Regarding claim 8,

As discussed above in regards to claim 1, the competing objectives constitute nonfunctional descriptive material and are not given any patentable weight.

Regarding claim 15,

Zitzler teaches wherein a dominance filter process is applied on the fused efficient frontier to create a global efficient frontier (see pg. 191).

3. Claims 9-13 rejected under 35 U.S.C. 103(a) as being unpatentable over Zitzler in view of Hauskrecht ("Linear Program Approximations for Factored Continuous-State Markov Decision Processes").

Regarding claims 9-13

Zitzler teaches wherein the generating the initial population of solutions of portfolio allocations includes generating portfolios with different combinations of competing values. In regards to claims 9-10, the types of competing objectives constitute nonfunctional descriptive material and are not given any patentable weight.

Zitzler does not teach wherein the generating solutions with different combinations of competing values are performed by adding additional competing value constraints to a linear program corresponding to the objectives of the competing values; wherein solutions with substantially all feasible combinations of the competing values are generated by modifying parameters of the added competing value constraints; and wherein nonlinear constraints are approximated with linear constraints generated by a sequential linear programming.

Hauskrecht teaches wherein generating solutions with different combinations of competing values are performed by adding additional competing value constraints to a linear program corresponding to the objectives of the competing values; wherein solutions with substantially all feasible combinations of the competing values are generated by modifying parameters of the added competing value constraints; and

wherein nonlinear constraints are approximated with linear constraints generated by a sequential linear programming (see pp. 2-3, conclusions).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to modify the method of Zitzler with wherein the generating solutions with different combinations of competing values are performed by adding additional competing value constraints to a linear program corresponding to the objectives of the competing values; and wherein solutions with substantially all feasible combinations of the competing values are generated by modifying parameters of the added competing value constraints. One skilled in the art would have been motivated to make the modification for efficiency.

(10) Response to Argument

a. Regarding the rejection of independent claims 1, 17, and 22 under 35 U.S.C. 103(a) as being unpatentable over Zitzler, Appellant argues that Zitzler teaches unifying a plurality of runs and removing the dominated solutions from the union set for the same multi-objective process whereas the claimed invention is directed to creating a union set for two different multi-objective processes (see Appeal Brief, pg. 22, first and second paragraphs). The argument is found unpersuasive for the following reasons:

Although Appellant claims performing a first multi-objective process and a second multi-objective process, the claim language does not require the first multi-objective process and second multi-objective process to be different processes (or algorithms); ie. the first and second processes may be the same algorithm performed

twice. As stated in the Advisory action, an analogy can be drawn to a computer running two processes (or instances) of the same computer program. The computer is still performing a first process and a second process even though the two processes contain the same instructions. Using similar logic, Zitzler teaches performing a first multi-objective process and a second multi-objective process since Zitzler teaches a plurality of runs for the same multi-objective process.

Examiner notes that, in general, sets of claims in which the independent claim recites a first entity and a second entity, with a dependent claim reciting that the first entity and second entity are the same, are not uncommon. Therefore, it is not unreasonable to interpret the first multi-objective process and second-multi-objective processes as the same algorithm being performed twice.

b. Regarding the rejection of independent claims 1, 17, and 22 under 35 U.S.C. 103(a) as being unpatentable over Zitzler, Appellant further argues that one skilled in the art would not be motivated to modify the Zitzler reference to meet the claimed invention because the Zitzler reference is directed to comparing the efficient frontiers from eight different multi-objective processes. To fuse the first and second efficient frontiers from different multi-objective processes would render the comparison study of Zitzler meaningless (see Appeal brief, pg. 22, third paragraph). The argument is found unpersuasive for the following reasons:

The argument is moot in view of the claim interpretation discussed in subsection (a) above; ie. the claimed invention does not require the first and second multi-objective processes to be different algorithms.

c. Regarding the rejection of dependent claim 2 under 35 U.S.C. 103(a) as being unpatentable over Zitzler, Appellant argues that dependent claim 2 specifies, *inter alia*, that the initial population of solutions is generated by using a combination of linear programming and sequential linear programming algorithms. In no way whatsoever can the Zitzler reference teach or suggest at least this feature (see Appeal Brief, pg. 22, fifth paragraph). The argument is found unpersuasive for the following reasons:

While Zitzler does not explicitly test an algorithm which is a combination of sequential linear programming and linear programming algorithms, Zitzler does not exclude other multiobjective algorithms: "there are many other methods that may be considered for the comparison" (see pg. 176). In evaluating the disclosure of a prior art reference, one must consider the knowledge of one of ordinary skill in the art at the time of invention. It would have been well within the knowledge of one of ordinary skill in the art that both linear programming and sequential linear programming were known at the time of invention. Therefore, an algorithm involving both methods could certainly be used in the comparison study of Zitzler while still yielding predictable results. Examiner notes that the purported novelty of the invention is in the fusion of the results of different algorithms and not in the specifics of the algorithms themselves.

d. Examiner notes that Appellant did not argue whether or not Zitzler teaches a solution space having at least three dimensions. This is construed as an admission that the reference teaches the limitation. Nevertheless, Examiner would like to clarify the portion of the rejection of the independent claims addressing this claim limitation. The particular portion of the rejection referred to is reproduced below:

> ... However, Zitzler teaches restricting to only two objectives in order to investigate the simplest case first. Therefore, Zitzler does not explicitly teach a solution space having at least three dimensions. However, it would have been obvious to one of ordinary skill in the art to extend the method of Zitzler to include a solution space having at least three dimensions since multi-objective optimization involving at least three dimensions was known in the art at the time of invention and the only reason Zitzler restricted to two objectives was for simplicity.

Examiner states that multi-objective optimization involving at least three dimensions was known in the art at the time of invention. Examiner is referring to the previous portion of the rejection which discusses the fact that Zitzler acknowledges the existence of solution spaces with more than two dimensions by limiting themselves to only two objectives for the simplest case; that is, Zitzler does not exclude solution spaces with more than two dimensions (objectives): "We thereby restrict ourselves to only two objectives in order to investigate the simplest case first." (pg. 177). As such, the statement that multi-objective optimization involving at least three dimensions is old and well known in the art is fully supported within the Zitzler reference and is therefore not an unsupported taking of Official Notice.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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